difficult to understand the omission, especially as space has been found for such uninteresting microbes as the *spirillum rubrum* and others.

The photographic illustrations, whilst remaining the same in number, have been in some cases changed; three of the new ones are devoted to comma-shaped bacilli resembling the cholera vibrio, one of them being the *vibrio aquatilis*, recently isolated by Dr. Günther himself from water, whilst two new plates have been added of the colonies of the cholera bacillus in different stages of development.

The volume is undoubtedly one of the best introductions to the study of bacteriology which has yet been produced. G. C. FRANKLAND.

OUR BOOK SHELF.

Lectures on Mathematics. Delivered from August 28 to September 9, 1893, at North-Western University, Evanston, Ill., by Felix Klein. Reported by Alexander Ziwet. (London: Macmillan and Co., 1894.)

IN these twelve lectures, which are excellently reported by Mr. Ziwet, it was the intention of Prof. Klein to present his hearers with an account of some of the modern developments of mathematics, particularly in those branches in which the lecturer himself has worked. Each lecture is therefore a unit in itself, and the whole work thus covers a wide range of subjects. The nature of the case precludes exhaustive treatment; the lectures are cyclopædic in character, and the copious references will please the readers who may wish to look up the original memoirs for details. It would be useless in a short review to attempt to do more than briefly describe the matter contained in these ninety-eight pages. We notice that geometrical methods of research are particularly emphasised, and their usefulness demonstrated in widely different territories. The first four lectures are purely geometrical in character, being devoted to the work of Clebsch (i.), to the geometrical side of the researches of Lie (ii. and iii.), and to the modern results on the real nature of algebraic curves and surfaces (iv.). Chapter v. treats of the application of geometrical methods to function-theoretical questions, illustrated by the case of the hypergeometric function. In chapter vi. Prof. Klein discusses the nature of space-intuition and the relation of mathematics to the applied sciences. The following chapter contains an account of Hilbert's simple proof of the transcendency of the numbers e and π, and chapter viii. contains a beautiful application of geometrical methods to certain problems of the number theory. By a simple construction the author has given to the composition of binary algebraic forms, and to the ideal numbers, a high degree of simplicity and clearness. The remaining chapters treat successively of the solution of higher algebraic equations, hyper-elliptic and Abelian functions, and non-Euclidian geometry.

Appended also is a translation of the article by Prof. Klein, entitled "The Development of Mathematics at the German Universities," written originally for the section "Mathematik" in the work "Die Deutchen Universitäten" (Berlin: A. Asher and Co., 1893).

English mathematical readers have to thank Mr. Ziwet for laying before them in a neat form the residue, so to speak, of this Evanston Colloquium.

Elementary Trigonometry. By H. S. Hall, M.A., and S. R. Knight, B.A. (London: Macmillan and Co., 1893.)

IF the knowledge of the subject under consideration varied directly as the number of text-books on that subject, there is no doubt that elementary trigonometry would be running very high for the first place among school-books. The law of the survival of the fittest, in its manifold forms, is appropriate for text-books, if for anything, and it is perhaps good that this is so, as we should soon be flooded out by their excessive number. Of late, however, books for beginners on this branch of mathematics have been of a high standard of excellence, and the one before us is no exception. The joint authors are well known for their school books on algebra, and their great experience in teaching has given them a real insight into "how to teach." To briefly enumerate the points which the authors name as special to this book, we may commence by saying that only those elementary parts have been handled which do not require the use of infinite series and imaginary quantities. Special prominence is given to examples, &c. on easy identities and equations, to enable the beginner to thoroughly master the fundamental properties of trigonometrical ratios. The subject of radian or circular measure is with advantage referred to later. Logarithms are fully dealt with, and special attention has been given to the exposition of problems on heights and distances. The examples in all chapters are numerous and typical. This book can safely be recommended to beginners, and it may, besides imparting to them a sound elementary knowledge of the subject, ingraft an intelligent interest for more advanced study.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Great Auk's Egg.

"A THANKLESS task the truth to tell," says a minor poet. In my note (*supra*, p. 412) I tried to do it in an impersonal way; but Mr. Harting, to my regret, introduces names (p. 432) while falling back upon a statement which was controverted three years ago, and is unsupported by fresh evidence. On some accounts I highly esteemed the late Mr. Bond, with whom I was acquainted for nearly forty years, and I am very sorry to impugn the accuracy of his memory: it is well known that he never kept a note of any specimen in his collection. I express no doubt that his tale of 1860 was correctly reported, and I have none as to the correctness of the report of the tale, purporting to be the same, told by him in 1889 (in Mr. Harting's presence, if I am not mistaken), and carefully taken down. A copy of this, now before me, shows that in the interim the tale, as tales are wont, had developed. In the later version the seller of the egg was "a fisherman who had been on a whaling ship"; but I hold that neither version is "deserving of consideration."

As to my own story my recollection is clear. I heard it more than once from Mr. Yarrell; and in its time it was common talk among the egg-collectors of those days, of whom I am one of the last. Not six months ago I was talking of it with the late Mr. Henry Walter, whom we have since lost. I find it supported by a memorandum made by me (I think) in 1862, which was based (I know) on one of earlier standing, though that is not forthcoming. But I have positive evidence in a letter written by Mr. Wolley from Lapland on February 5, 1857, in reply to one just received from me giving him particulars of the sale of Mr. Yarrell's collection in December, 1856. Therein Mr. Wolley, who on a point like this could not err, recalling its lately deceased possessor, and remarking on the change of owners, wrote of "Yarrell's eyes as he told the often repeated story of his buying the egg in Paris—this very egg now in Gardner's hands."

To some it will seem a small matter where Mr. Yarrell bought the egg; but to those who have tried to tell the Garefowl's true history, it is disheartening to find belief sought for the Boulogne version, as it shows how their trouble has been thrown away. No one with any knowledge of facts could suppose that the

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species had a breeding-place near which any whaling ship, in the present century at least, ever went; and those who accept this version recur to errors that were refuted by Prof. Stenstrup more than five-and-thirty years ago. ALFRED NEWTON.

Magdalene College, Cambridge, March 10.

The Decomposition of Liquids by Contact with Cellulose.

THE recent work of Dr. Gore, on "The Decomposition of Liquids by Contact with Powdered Silica," presents a striking resemblance to what has from time to time been ascertained with such substances as cellulose. In fact, the properties ascribed to silica are very likely shared under some conditions by colloids in general, whether they be "organic" or "inorganic" bodies. Cellulose, when immersed in diluted solutions of some metallic salts, has the power of abstracting from them a certain quantity of the salt for which it may have no chemical affinity as ordinarily understood. The amount of salt abstracted is dependent upon several conditions: the degree of dilution of the salt; the ratio of cellulose to salt; the ratio of cellulose to weight of solution; the temperature; the physical condition of the cellulose; and the chemical constitution of the cellulose.

Let us, in order to eliminate the last-named condition, confine ourselves to pure cellulose or cotton. When cotton wool is placed in a solution of a metallic salt, it abstracts the salt from the solution until equilibrium is established. If we regard the part played by the cellulose in the light of Witt's theory of solid solution, the amount of salt retained by cellulose is conditioned by the relative solubility of the salt in water and cellulose, and the ratio in which the three exist together. If water is now added, a certain amount of the salt dissolved by the cellulose will become resoluble in the water. Also, if the solution be concentrated, the fibre will generally take up a further quantity. In some cases, however, the amount of salt taken up by the cellulose is not imparted to the solution on dilution. This is probably due, as in the case, I believe, of the ferric salts, to dissociation in solid solution. The dissociated base being insoluble (in water) is retained by the cellulose on addition of water, whereas the acid may be dissolved. The physical condition of the same cellulose has a great influence upon the amount of salt which it is capable of dissolving. If cellulose be finely disintegrated, it behaves differently from that in which the ultimate fibres remain intact.

The cotton fibre, when seen under the microscope, is found to vary considerably in shape and size. It is probable, then, that each fibre has a certain constant of absorption peculiar to itself. Cellulose, when rendered anhydrous by placing it in a water-bath or desiccator, is found to rise considerably in temperature when exposed to a damp atmosphere. This may, however, be caused by the liberation of heat, due to the condensation of moisture from the gaseous state. If so, no rise of temperature would be noticed in plunging anhydrous cellulose into water. It appears, however, that cellulose is susceptible of a certain degree of hydration in coming in contact with water, which is probably attended by the liberation of heat. I have found that dried cellulose placed in a damp atmosphere remains at a higher temperature than its surroundings so long as it is taking up moisture, which appears to be greatest when the rate of absorption is greatest. By the time it has recovered its normal condition of moisture it has sunk to the temperature of its surroundings.

The above considerations seem to point out that cellulose, like silica, exhibits well the phenomena of solid solution.

C. BEADLE.

Physiological Psychology and Psycho-physics.

IN a note contained in your issue of January 11 (p. 252), upon the teaching of psycho-physiology in University College, I notice two errors; which, as they are, unfortunately, very wide spread, you will perhaps allow me to correct.

(1) "Physiological psychology" and "psycho-physics" are not one and the same thing. The former science is a specially limited and specially enlarged psychology. Limited: in that it pays more attention to experimentation carried out by physiological methods than to any other psychological experimentation. Enlarged: in that it discusses the most important problems relating to the physical basis of mental life. These latter problems belong to psycho-physics, which is the science of the relation of "mind" to "body."

(2) A "practical course in psycho-physiology," which confines itself to the senses, is not a representative or adequate course, as the note implies. The psycho-physics of sensation is no more the whole of psycho-physics than the physiology of the sense-organs is the whole of physiology, or the psychology of sensation, perception, and idea, is the whole of psychology. A historical accident has led to this popular restriction of the term; but a glance at the literature of the science will show its wrongness. E. B. TITCHENER.

Cornell University, February 16.

DR. TITCHENER'S criticism of my note strikes me as a little strange. First of all, he objects to my speaking of "physiological psychology *or* psycho-physics," maintaining that they are different, and then proceeds at once to subsume psycho-physics under physiological psychology. As a matter of fact, psycho-physics, as understood by Fechner, the coiner of the word, and generally up to quite recent times, does not directly refer to the relation of the organism to psychical phenomena at all, but to the relation between the (extra-organic) stimulus and sensation, though of course this inquiry leads on to two further inquiries: (*a*) the relation of the extra-organic to the organic process, and (*b*) the relation of this last to sensation. Münsterberg and others now use "psycho-physical" for relations generally between neural processes and psychical processes, but the change of meaning is a little confusing. Anyhow, it will be seen that there is no general agreement about the expressions "physiological psychology" and "psycho-physics," such as Dr. Titchener's note suggests.

I may add that in using "or" rather loosely (as I felt justified in doing in a short note), I did not mean to imply that the two branches of inquiry were identical. I wanted to call attention especially to the fact that the course would go systematically over an experimental inquiry *into the senses* which would necessarily include reference to stimulus, and so psycho-physics, and reference to nerve process, and so physiological psychology. As to Dr. Titchener's second "error," I find him hypercritical. I am well aware that psycho-physiology covers more than the senses, and I think that nothing which I say implies the contradictory of this. There can surely be a practical course on a subject which does not exhaust all divisions of the subject. As a matter of fact, however, Dr. Hill *is* taking up other branches, as reaction-time experiments. I was content to emphasise the fact that *the senses* would be systematically examined; and all who know what psycho-physiology has done, know that by far the larger part of the really fruitful work leading to definite results has been done in the investigation of the senses. THE WRITER OF THE NOTE.

March 3.

THE LAST GREAT LAKES OF AFRICA.[1]

ADMIRABLY translated as it is, this book scarcely retains a trace of its previous existence in a foreign tongue; but although the translator states in the preface that she has slightly condensed the original matter in bringing it to its present form, we believe that much more rigid compression might wisely have been applied. Earlier books have placed later travels in Eastern Equatorial Africa so prominently before the British reader, that much of the ground which was full of fresh interest when the two gallant Austrians traversed it is now familiar, and its features common-place. Thus a great part of the first volume, detailing the troubles of inexperienced and, perhaps, somewhat imperious Europeans in organising a large caravan at Zanzibar and Pangani, and in crossing the coast-lands and ascending the slopes to Kikuyu, might well have been omitted without lessening the thrilling interest of subsequent chapters.

The expedition, primarily a sporting one, was also in large measure exploratory, and if the pursuit of big game, and the hairbreadth escapes of the hunters

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[1] Discovery of Lakes Rudolf and Stefanie. A Narrative of Count Samuel Teleki's Exploring and Hunting Expedition in Eastern Equatorial Africa in 1887 and 1888. By his companion, Lieut. Ludwig von Höhnel. Translated by Nancy Bell (N. D'Anvers). With 179 original illustrations and five coloured maps. In two vols. (London: Longmans, Green, and Co., 1894.)

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